DESIGN NOTES

Specifications:
Design:
Bridge Design Specification (1983 AASHTO Specifications with revisions by Caltrans)
Load Factors: 1.5 D + 1.5 E + 2.5 (L + I)
Where D=Dead Load
E=Earth Load
L=Live Load
I=Impact
Capacity reduction factor is included.

Loading:
Live load:
HS20-44 truck
Apply impact only to the roof slab.

Earth Cover	Impact (%)
Up to 300 mm (1.0')	30
301mm to 600 mm (1.1' to 2.0')	20
601mm to 900 mm (2.1' to 3.0')	10
Over 900 mm (3.0')	0

No surcharge on walls due to live load.
Earth load:
Earth pressures for two conditions:
22.0 kPa/m (140 lbs/CF) vertical, 6.6 kPa/m (42 lbs/CF) horizontal.
22.0 kPa/m (140 lbs/CF) vertical, 22.0 kPa/m (140 lbs/CF) horizontal.

Unit stresses:
f'_c = 25 MPa (3600 psi)
f_y = 400 MPa (60,000 psi)

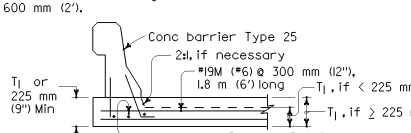
Distribution "d" bars:
Up to and including 3.0 m (10') cover
Expressed as a percent of main positive reinforcement required: $\frac{100}{0.05726\sqrt{S}}$, $\left(\frac{100}{\sqrt{S}}\right)$ Max 50%.
Over 3.0 m (10') cover
#13M (#4) @ 450 mm (18") maximum.

Shear:
maximum allowable shear, $v_c = 0.29\sqrt{f'_c}$, MPa, ($v_c = \sqrt{3.5 f'_c}$, psi)

Exclusions:
Compressive reinforcement and negative-moment reduction (for continuity) do not apply.
Axial loading on members has not been considered.

CONSTRUCTION NOTES

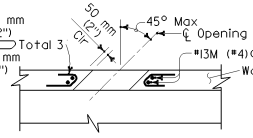
Construction loads:
Strutting required as shown on Standard Plan D88. Strutting may be required on culvert extensions when existing parapet is removed.
Expansion joints:
Invert:
No expansion joints shall be permitted.
Roof and Walls:
When cover is less than span length-
Place 13 mm (½") expansion joint filler at 9 m (30') ± centers outside the paved roadway lanes and place Bridge Detail 3-2, Standard Plan B0-3, at 9 m (30') centers under paved roadway lanes.
When cover is more than span length-
Place 13 mm (½") expansion joint filler at 9 m (30') ± centers and additional 13 mm (½") expansion joints at locations of change in foundation character, as directed by the Engineer.
Construction joints:
Temporary joints may be permitted if normal (or radial) to ℄ of RCB. Otherwise, the contractor is to submit a proposal for consideration.
Cutoff walls:
1.2 m (4') cutoff walls are to be provided at inlet and/or outlet unless adjacent channel is lined and unless otherwise shown. These walls are to be extended if scour conditions warrant.
Earthwork:
See Standard Plan A62E.
Backfill:
See Standard Specifications, except that the difference in level of backfill (against outside walls) shall not exceed 600 mm (2').



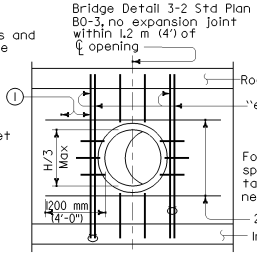
BARRIER SECTION 9.0 m (30') MINIMUM

GENERAL NOTES

Designation:
Standard single or multiple box culverts are shown on plans as span times height with maximum cover over roof thus: 2440 mm x 1520 mm (8' X 5') RCB with 3 m (10') or DBL 3050 mm x 1520 mm (10' x 5') RCB with 6 m (20'), followed by alternatives.
Alternatives:
Single cell: Invert will be sloped unless "trapezoidal invert", "flat invert" or "V invert" is included in designation
Multiple cell: Invert will be vee unless "flat invert" is specified. Ends of culvert will be rounded unless "square ends" are designated. Parapets will be as shown unless designated in plans. Such designations may be different for inlet and outlet ends.
Quantities:
Quantities are for the sloped or vee invert and do not include "d" bars, nor splices in longitudinal bars, nor temperature reinforcement for exposed roof, nor concrete or reinforcement for parapets, cutoff walls or paving notches.
Reinforcement placement:
Main reinforcement is to be placed transverse or, for curved culverts, radial. When radial, reinforcing spacing of the "a", "f" and "g" bars is measured along the centerline. Stagger splices not shown. Hooks may be rotated or tilted, as necessary, for clearance.
Special reinforcement coverage:
Box standard plans are not to be used for culverts in a corrosive environment or where there is a severe abrasive flow condition or in freeze-thaw locations.
Special design:
Required for culverts with conditions, loads, design bearing pressures or sizes greater than those given on this plan or Standard Plans D80 & D81. Also required for multiple cell culverts with unequal spans. For culverts with railroad loading, see the current AREA design specification.
3 or more cells:
For culverts with more than two cells, use dimensions and reinforcement for the standard "double box culvert" and adjust quantities accordingly.



PART PLAN-SECTION

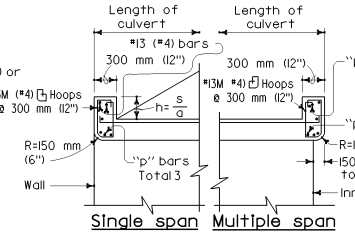


LONGITUDINAL SECTION

UTILITY OPENING-WALL

H= Height of box

Ⓘ Adjacent to each side of the opening, place additional bars aquivalent to half the interrupted main reinforcement.



PARAPET DETAIL

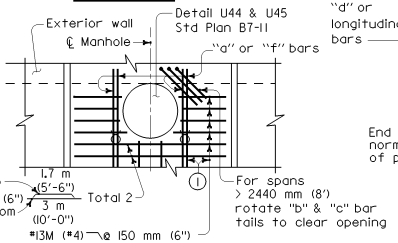
s = Clear span (mm)
a = 12 cosine skew angle

Parapet "p" bars			
Span \ Skew Angle	0° TO 15°	16° TO 30°	31° TO 45°
1220 mm (4')	#13M (#4)	#13M (#4)	#13M (#4)
1830 mm (6')	#13M (#4)	#13M (#4)	#16M (#5)
2440 mm (8')	#13M (#4)	#16M (#5)	#19M (#6)
3050 mm (10')	#16M (#5)	#19M (#6)	#22M (#7)
3660 mm (12')	#19M (#6)	#22M (#7)	#25M (#8)
4270 mm (14')	#22M (#7)	#25M (#8)	#29M (#9)

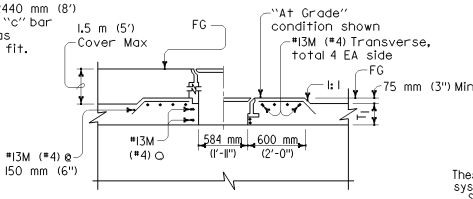
PARAPET REINFORCEMENT

Height \ Cover	3 m (10')	6 m (20')
1830 mm (6')	95 kPa (1.0 TSF)	150 kPa (1.6 TSF)
2440 mm (8')	105 kPa (1.1 TSF)	160 kPa (1.7 TSF)
3050 mm (10')	115 kPa (1.2 TSF)	170 kPa (1.8 TSF)
3660 mm (12')	125 kPa (1.3 TSF)	180 kPa (1.9 TSF)
4270 mm (14')	135 kPa (1.4 TSF)	190 kPa (2.0 TSF)

DESIGN BEARING PRESSURE

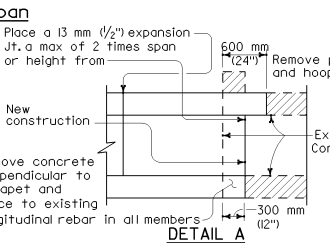


PART PLAN



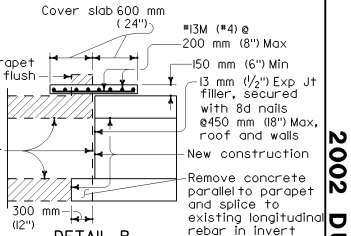
PART LONGITUDINAL SECTION

MANHOLE



DETAIL A

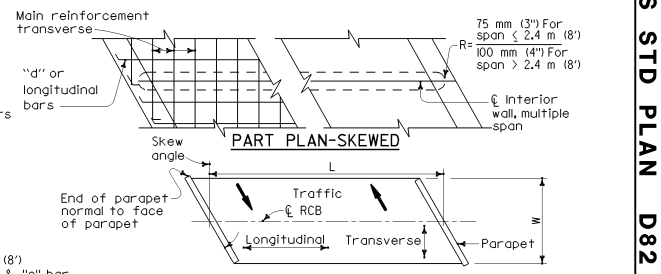
(20° maximun skew as shown. If existing longitudinal and transverse reinforcing bars in top slab are lap spliced with new longitudinal and transverse reinforcing bars, the 20° skew may be exceeded. Lap splicing may require removal of top slab in excess of 600 mm (24") shown.



DETAIL B

(Single cell only, no skew allowed, 300 mm (12") minimum cover.)

CULVERT EXTENSION



PART PLAN-SKEWED

RCB TERMINOLOGY

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE REINFORCED CONCRETE CULVERT MISCELLANEOUS DETAILS

These "Standard Plans for Construction of Local Streets and Roads" contain units in two systems of measurement: International System of Units (SI or "metric") and United States Standard Measures shown in the parentheses ( ). The measurements expressed in the two systems are not necessarily equal or interchangeable. See the "Foreword" at the beginning of this publication.

NO SCALE

D82

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Paul Cotter
REGISTERED CIVIL ENGINEER
July 1, 2002
PLANS APPROVAL DATE
Paul Cotter No. C34509 Exp. 9-30-03 CIVIL
REGISTERED PROFESSIONAL ENGINEER STATE OF CALIFORNIA

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2002 DUAL UNITS STD PLAN D82

125

THIS STANDARD PLAN D82 INCLUDES CHANGES THAT WERE INCORPORATED IN REVISED STANDARD PLAN RSP D82, DATED OCTOBER 26, 2000, AND ISSUED AS A PART OF ERRATUM NO. 99-1 FOR THE 1999 METRIC STANDARD PLANS.